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ABSTRACT

The effects of changes in spatial density on preschool children's behavior were examined in a quasi-experimental study involving repeated measures taken on two experimental groups and one control group. Subjects were all 59 children registered in three rooms of a non-profit public day care center in Edmonton, Alberta, Canada. Both quantitative and qualitative data were gathered. Room scan and child scan methodologies were used to measure children's behavior. By using a model of the day care room, interviews were conducted among selected, articulate children exposed to the spatial change. Staff exposed to the change were also interviewed. In the experimental rooms, density was altered from low to high and back to low for the initial 2, medial 3, and the final 2 weeks of the study respectively. Barriers were used to reduce the amount of uncovered space by approximately 40%. Density in the control room was low for the entire 7 weeks. A summary of the findings from the room and child scans and the complete discussion of the child and staff interviews are provided in this report. Related materials, including child scan recording sheets and coding categories, diagrams of rooms in regular and compacted conditions, as well as interview protocols and selected responses, are appended. (Author/RH)

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GLENGARRY RESEARCH PROJECT REPORT

The Effects of A Change in Spatial Density on Children's Behaviour in a Day Care Setting

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INTRODUCTION TO THE PROJECT

This project was designed to examine the effects on children's behaviour of changes in the spatial density in a group day care center. The effects of the spatial manipulation were examined from four perspectives. To provide quantitative data a room scan and a child scan methodology were used to measure children's behaviour. To provide qualitative data children and staff exposed to the spatial change were interviewed. Data collection was carried out in two experimental rooms and one control room. The data collection period for the room scan and the child scan extended over thirty-three days during which the children in the two experimental rooms were exposed to two spatial densities. The control room data were gathered on sixteen alternating days. No spatial variation occurred in this room. The interview data were collected after a return to the normal space. Data were collected by trained observers and checked for reliability. Data analysis for the child scan and the room scan data involved the computation of frequency and percentage scores. The interview data were categorized into categories derived from the data. Findings were compared for density, room, age and sex, and time of day. The information obtained was analyzed to provide answers to the questions developed to study the changes in space.

The remainder of this report presents the background to the project, the research questions, describes the methodology, and summarizes the findings and conclusions. Separate reports containing more information and detail are available for the room scan (Dill, 1980) and the child scan play categories (Fishburne, in preparation).

BACKGROUND FOR THE STUDY

The factors which influence the development of young children are of great importance because the early experiences of a child are generally acknowledged to be influential in later development. The environment a young child experiences is considered to play an important part in encouraging physical, social, emotional, intellectual and language development (Ambron, 1975; Bloom, 1964; Hunt, 1961; Lewis &

Rosenblum, 1975). Early interaction between the child and a rich and varied environment provides the conditions necessary for optimal growth and development (Caldwell, 1971; Ellis, 1973; Hunt, 1961).

Within the previous two decades, social and economic trends have resulted in the environmental setting for many young children changing for a large part of the day from the family home or neighbourhood baby-sitter to group day care settings. According to the report of the National Day Care Information Centre (1979) the number of children enrolled in full-time group care in 1979 was 78,653, an increase of over 50,000 since 1973. With an increasing number of children spending a substantial portion of their early childhood years in group day care, it is necessary to obtain more information on the effects of group care on these children. If we are able to determine which factors are most conducive to producing optimal growth and development conditions for young children, we may be able to plan programs and environments which encourage children to achieve their maximum potential.

Space is one environmental factor which appears to influence young children's behaviour, and in particular, density aspects of the space (Loo, 1972; McGrew, 1970; Rohe and Muffer, 1977). Density which may be defined as the amount of space available per person, is a spatial variable closely related to crowding. Crowding refers to an experiential state in which the limitations of the space are perceived by the individuals exposed to them and cause some discomfort. Differing densities will produce differing perceptions of crowding depending upon the situation and the individuals involved. Because perception is an important factor in the determination of behaviour, the effects of variations in spatial density were examined from both a quantitative and qualitative perspective. For this project, room scan data and the child scan data provided a quantitative picture of children's behaviour, and the interviews with the staff and the children provided a qualitative understanding of the perceptions of the effects of spatial variations.

Density has been considered an important variable when standards for adequate facilities for day care have been established. Government

legislation states minimum space standards which determine density levels in day care centers. These standards vary greatly according to the province or state in which they apply. At present there is no definitive research which defines an optimum ratio of children to space in day care. Several figures are advocated but they do not appear to have an empirical basis. The Child Welfare League of America (1972) advocates a ratio of 4.9 m^2/child (50 sq. ft./child) excluding bathroom, cooking facilities, stairs, halls or offices, and recommends that the amount of playroom space per child should not be under 3.36 m^2/child (35 sq. ft.). The Canadian Council of Social Development (1973) proposes that 3.36 m^2/child be the absolute minimum space required in full time day care centers and that 4.8 m^2/child be the minimum for infants. They have suggested that 3.84 m^2/child (40 sq. ft./child) is a more desirable ratio and one which day care regulations should gradually adopt. A survey of the relevant literature in the United States (CSWR, 1977) found that the recommended minimum standards ranged from 1.92 m^2/child (20 sq. ft./child) to 5.70 m^2/child (60 sq. ft./child) with a 3.36 m^2/child being the figure most frequently stated. It was found that there was no empirical evidence to support these standards and that the standards were primarily based on the opinions of professionals in related fields such as architecture, child development, and the social sciences.

In Canada, space regulations for day care are a provincial responsibility. The legislative requirements dealing with the amount of space per child, aged two to six years, in an indoor full-time day care setting range from 2.4 m^2 (25 sq. ft.) in Manitoba and Quebec to 3.84 m^2 (40 sq. ft.) in Newfoundland (Mathien, 1978). In Ontario the legislation specifies that there must be one activity room for each 25 children between the ages of two and six, which indicates that group size has also been considered a relevant variable when determining quality of child care.

The regulations in Alberta allow a minimum ratio of 2.5 m^2/child (26.4 sq. ft./child) for every room used for playing, resting or sleeping (Government of Alberta, 1978). For purposes of subsidy the City of Edmonton requires a ratio of 3.36 m^2/child. The center

where the study was located has a ratio of 4.3 m^2/child (45 sq. ft./child) in each room, well in excess of the minimum provincial requirements and closely approximating the optimal standards advocated by the Child Welfare League of America.

In summary, a sustantial number of children are enrolled in full time day care programs during a period of their lives which is acknowledged as having an influential effect on further growth and development. Environmental variables and, specifically, the amount of space allotted per child may be determinants of children's behaviour. There are conflicting positions regarding the optimal amount of space per child and no definitive research has been produced which illuminates this problem. This study investigated the effects of variations in spatial densities on the behaviour of children in a day care setting from both a quantitative and qualitative perspective.

RESEARCH RELATED TO THE PROJECT

A brief summary of the research related to the theoretical background of the study is presented here. For more detailed discussions of the research see separate reports on the Room Scan data (Dill, 1980) and the Child Scan data (Fishburne, in preparation).

The study of the effects of variations in spatial densities on the behaviour of children is an attempt to understand one way in which individuals and the environment influence each other. The discipline of environmental psychology which investigates the interrelationships between man and the environment has categorized the relationship into three main positions: man is a product of the environment, the environment is a product of man, and man and the environment are interrelated and influence each other. The third position, often described as the interactionist position, provides the theoretical basis for this research project. The interaction effect results from the dynamic interchange between man and his environment. Ambron (1977) states that "developmental change is the outcome of continuous interaction between the individual and the environment" (p. 4). The study of the relationship between differing densities and the behaviours of children from both quantitative and

qualitative perspectives acknowledges that an understanding of each component part of the relationship is necessary to understand the interaction.

Barker (1968) developed the concept of behaviour settings to study the relationship between man and environment. He determined that certain patterns of behaviour were specific to certain milieus and that these behaviour-milieu relationships remained constant over time. Each behaviour setting has a non-behaviourial component which refers to space or milieu, and a standing pattern or program of behaviour which is considered appropriate to the milieu (setting specific behaviour). The influence of the setting in determining behaviour is strong enough to override individual differences which accounts for the great similarities of behaviour according to setting (Gump, 1974). Some of the factors which determine that the setting and setting specific behaviour are congruent include physical forces such as arrangement of furniture, social forces such as social norms, physiological forces, selection of settings to meet individual needs and exclusion of individuals who do not conform to accepted patterns of behaviour. Influences originate with both the individual and the environment. The relationship between the component parts of the behaviour setting is such that a change in one part is manifested by changes in other parts. This is characteristic of the interactive nature of the relationship.

Idiosyncratic characteristics of individuals will affect their view of the environment and their response to it. The dynamic interaction of individual characteristics with environmental stimuli produces perceptions unique to the individual. Thus individuals will respond in a unique manner to a common environmental stimulus based on their perceptions of that stimulus. However, Hall (1966) has suggested that individuals in the same culture and society tend to have similar perceptions of environment which differ from those of individuals in other cultures. This similiarity of perception founded on similiarity of experience encourages similar reactions to environmental stimuli.

One environmental variable which is viewed as a possible determinant of behaviour is the spatial environment. It has been found

that play behaviours of preschool children are influenced by amounts of play equipment (Johnson, 1935; Smith & Connelly, 1976), organization of play areas (Hoffman, 1976; Kinsman & Berk, 1979; Prescott, Jones & Kritchevsky, 1972), setting in which play occurs (Shure, 1963), and density of the play area (Loo, 1972, 1976, 1979; McGrew, 1970; Rohe & Nuffer, 1977; Shapiro, 1975). It is this last variable, density, which will be researched in this study.

Most of the research on density in preschool settings occurs during free play situations. One means used to determine the effectiveness of an environment has been to examine children's play behaviour. Play theorists have stated that the type of play is important both as a precursor of later play modes and as an indication of the child's development (Bruner, 1976; Piaget, 1962; Smilansky, 1968; Sutton-Smith, 1971). Research shows that various factors present in the environment may affect play behaviours. The differences in physical settings, the space and materials available appear to create different types of play behaviour (Frost & Campbell, 1978; Kinsman & Berk, 1979; Loo, 1972, 1976, 1979).

Research on density in preschool settings focused on the effects of variations of density on social interaction and agonistic behaviour during play. Other areas studied have been use of space and use of materials. The general finding on the effects of density on preschool children is that in higher density conditions there appears to be an increase in aggression and conflict situations and a decrease in social interaction. This finding, though, is not universal and, in fact, some researchers have found little difference, or trends in opposite directions. One factor which may have produced the conflicting results is the lack of consensus as to the definition of high and low density. Definitions used in the research overlap and in many cases the differences within the high and low density conditions are larger than the differences between them.

Review of the research pointed to the need for additional studies on the impact of variations in density on children's behaviours. Methodological problems present in the studies made evident the need for design features adopted for this study.

RESEARCH QUESTIONS

To establish a framework for approaching the problem of studying variations in spatial density the following questions were used to focus data collection and analysis, and discussion of the findings. The questions are presented according to the methodology used.

QUESTIONS RELATED TO THE ROOM SCAN METHODOLOGY

1. What differences occur in setting usage behaviours of children in two different spatial densities (high and low)?
2. What differences occur in the amount of setting specific behaviour of children in two different spatial densities (high and low)?
3. What differences occur in social interactive behaviour of children in two different spatial densities (high and low)?

QUESTIONS RELATED TO THE CHILD SCAN METHODOLOGY

1. What differences occur in social play behaviours of children in two different spatial densities (high and low)?
2. What differences occur in cognitive play behaviour of children in two different spatial densities (high and low)?
3. Does a period of time spent in a high density condition have a subsequent effect on the way children play in a low density condition?

QUESTIONS RELATED TO THE CHILD INTERVIEWS

1. Do children recognize changes in their spatial environment?
2. Do children prefer areas of smaller or larger spatial area?

QUESTIONS RELATED TO STAFF INTERVIEWS

1. What changes, if any, were perceived by the staff members between the regular and high density condition for:
   a. children's use of space
   b. children's emotional and social behaviours
   c. staff-child relationships
   d. staff work satisfaction
   e. program

2. What changes were recommended, if any, if staff were required to work permanently in a smaller space?

METHODOLOGY OF THE PROJECT

Research Design

The design for this study was quasi-experimental and involved repeated measures taken on two experimental groups and one control group. Data were collected on the children in three rooms and a community day care center. In the experimental rooms, observations were made in the regular low density condition for the first two weeks, in the high density condition for the next three weeks, and then again in the low density condition for two weeks. In the control room, observations were made in the regular low density condition for the entire seven week period.

Data Collection Methodologies

1. Room Scan

The methodology used to discover children's use of space and behaviour in space was a room scan. This was based on a methodology developed by McGrew (1970) and McGrew and McGrew (1972). They used a room scan technique to study nursery children's use of space and social interactions. Tyler (1975) used a similar instrument to record children's interactions with the environment but divided the room into settings which were defined by the activities which occurred in each area.

Massing (1979) used the room scan methodology as developed by McGrew (1970) with modifications based on Tyler's methodology to gather information in the same setting in an exploratory study carried out one year prior to the present project. Her observations were recorded every two minutes on a room scan map corresponding to the room settings. This methodology was found to be a successful quantitative indicator of children's spacing activities and their social activities within the space. Specific categories are defined in the Dill (1980) thesis.

2. Child Scan

Children's play behaviour in the two density situations were measured using a child scan methodology. Observers used a child scan recording sheet modified from a previous study by Frost and Campbell (1978). A point-time sampling technique was used to observe a child and then to record and categorize play behaviours according to play typologies based on Parten's (1932) social play hierarchy and the Piaget-Smilansky cognitive play categories.

Each child was observed in succession for a ten second interval and then coded for setting, behaviour, activity, and if appropriate a social and cognitive play category. See Appendix A for definitions of the categories and a sample recording sheet.

3. Child Interviews

Research which has investigated the development of children's spatial representations suggests that children acquire their perception of space through their active involvement with the environment (Piaget and Inhelder, 1967). Children respond to space egocentrically relating characteristics of their own environment to their own position in it. Thus they are able to construct a linear system of spatial representation according to patterns of use, but are unable to perceive of the environment as a whole with inter-environmental relationships. The use of models with young children has determined that they may be able to relate better to small scale representations of larger space than with the actual space (Acredola, 1977; Downs and Stea, 1973). Siegal and Schadler (1975) discovered that kindergarten children were able to accurately construct from memory a model of their classroom. Theory and research concerning the spatial conceptualizations of young children support the use of a model to facilitate spatial representation of large scale spaces.

The exploratory study by Massing (1979) used a model of the day care room to explore children's awareness of their use of space. Using this same model, children in this study were asked a series of questions to ascertain their reactions to the change in density.

4. Staff Interviews

Current research theory on study of behaviour in context, the ecological setting, advocates the need to study the understandings held by the participants themselves (Bronfenbrenner, 1979; Gump, 1976). Data thus obtained provide a check on the validity of the category systems used to collect quantitative data and on the findings from the quantitative data as well as adding to the depth of understanding.

The interviews with the staff of the day care center were conducted using open ended questions intended to encourage the staff to comment on behaviour related to the quantitative data gathered during the research project as well as their personal reactions to the changes. Staff members were asked to comment on the patterns of setting use, social and emotional interactions, program changes, staff-child relationships, and staff reactions related to the change in space during the high density conditions.

Setting for the Project

The project was located in a non-profit public day care centre in the City of Edmonton. The center contained four child care rooms similar in physical size, organization, amount of equipment, group size, staff-child ratio and staff qualifications. Of the four rooms available, one was eliminated because of staff vacations during the data collection period. Two of the rooms were designated as experimental rooms, Room A and Room B, and the other room, Room C, was the control room.

In the experimental rooms a barrier of screens was placed across one end of the room which increased spatial density by reducing the amount of space. Equipment and furniture which had been located in the regular space was moved into the compacted space. When calculating the area available to the children, only uncovered space was considered. Uncovered space included the area which was not covered by cupboards or other furniture which eliminated access to floor space. Each room's dimensions, area, covered and uncovered space in the low and high density conditions are described in Table 1.

Table 1

Spatial Descriptions of Rooms in the

Low and High Density (in Meters)

	ROOM A		ROOM B		ROOM C
Density Condition	Low	High	Low	High	Low
Dimensions (m)	13.6 x 7.2	8.8 x 7.2	13.6 x 7.2	9.1 x 7.2	13.6 x 7.2
Area (m^2)	97.9	63.4	97.9	65.5	97.9
Covered Space (m^2)	10.3	9.1	12.2	11.0	11.9
Uncovered Space (m^2)	87.6	54.3	85.7	54.5	86.0
Density - m^2(ft^2)	4.38(47.1)	2.7(29.1)	4.29(46.2)	2.7(29.1)	4.3
Space deleted (m^2)		34.5		32.4	

Each room was organized into smaller settings according to the materials and equipment located in an area. Detailed descriptions of each setting are located in Dill (1980). When the rooms were compacted, every effort was made to ensure that the amount of equipment and the resources available were maintained as well as the organization and the relative location of the settings. Diagrams of the rooms in the regular and compacted conditions are presented in Appendix B.

Changes that did occur in the experimental rooms in the high density condition include the elimination of the Under Loft Area in Room A, and the Access/Chalk Area in Room B. In Room A, the location of the Paint Easel was moved. In Room B, the tables in the Table Toy Area and in the Playdough Area were replaced with smaller ones. In both Room A and Room B, the Block Area was moved to the area underneath and adjacent to the Big and Little Lofts. This area was most changed in terms of configuration with the addition of a "roof".

The Children

The subjects for the research project were all 59 of the children registered in three rooms of the day care center. Data was collected on all children for the room scan and the child scan section. For analysis of the room scan data, scores for 16 children were discarded, and for the child scan data scores for 15 children were discarded. In all cases, children had not been observed in at least 65% of the scans. The number of children in each room is described by sex and age groupings in Table 2. When the figures for the room scan and the child scan differ, the figures for the room scan are presented in brackets.

Table 2

Number and Age of Children

	OLDER		YOUNGER		TOTAL	
	Registered	Subjects	Registered	Subjects	Registered	Subjects
Males						
Room A	6	5(4)	4	4	10	9(8)
Room B	4	2	4	5	8	7
Room C	5	4	7	3	12	7
TOTAL	15	11(10)	15	12	30	23(22)
Females						
Room A	5	3	5	4	10	7
Room B	6	3	5	2	11	5
Room C	5	6	3	3	8	9
TOTAL	16	12	13	9	29	21
					TOTAL 59	44(43)

The children who were interviewed were selected from the total group of children in the two experimental rooms. The children were chosen, in consulation with the staff, as those most likely to be able to articulate their perceptions of the changes in the spatial environment. Twelve children were interviewed, six males and six females. They ranged in age from 3.3 years to 5.9 years with six children younger than 4.5 years and six children older than 4.5 years. Five of the children were from Room A, and seven were from Room B.

The Staff

The staff for each room included a room supervisor, a full-time child care worker and a half-time child care worker. During the data collection period the room supervisor or the full-time child care worker was present. It was also common to have the half-time staff member with either one or both of the full-time staff working in the room. The maximum child-staff ratio varied from 20:1 to 20:3 during the data collection period. The staff members were all trained in the area of child care with similar types and amounts of experience. All agreed to participate in the data collection by observation and interview.

Data Collection Procedures

1. Room Scan

Room maps for each room corresponded to the settings delineated by tape on the floor. The maps were used by an observer who scanned the room setting by setting in numerical order during a two-minute period. In each setting, the observer noted the presence of every child and staff member, whether a child's behaviour was setting specific or non-setting specific, and the category of social interaction in which a child was engaged. The scan was repeated 30 times during a one hour free play period in the morning. When the space was compacted, a new room scan map was made to correspond with the rearranged settings. Data were collected for 33 consecutive weekdays in Room A and Room B, and 16 alternating days in Room C.

Four observers trained for 10 hours before data collection began and a level of 89% agreement was reached between the criterion observer and the other three. During the data collection period, the criterion observer gathered data simultaneously with each of the other observers for 12.5% of the total scans made and the average level of agreement reached was 91.8%. For a more detailed discussion of the room scan methodology see Dill (1980, Chapter Three).

2. Child Scan

Data were collected by 10 observers using the Child Scan Recording Sheet. Each observer was equipped with a portable tape recorder and an earphone which emitted a beep every ten seconds. The observer located the child, watched for ten seconds and then coded the child for setting, behaviour, activity, and if appropriate a social and cognitive play category. Only the information for the social and cognitive play categories has been analyzed for this report. Four scans were made at 15 minute intervals within a one hour free play period in the morning and again within a one hour free play period in the afternoon. Morning data collection occurred simultaneously with the room scan data collection.

The ten observers were involved in a minimum of 10 hours of training to a reliability of at least 80% across all coding categories. Most observers were assigned to collect data in just one room creating teams of two or three in each room. Two observers were used in all three rooms as criterion observers for determining reliability and in case any observer was unable to code. Reliability based on 12% or more of the scans varied from 75% to 92% depending upon the play category. It was higher for the cognitive categories, similar to reliability findings in other studies.

For a more detailed discussion of the child scan methodology see Fishburne (Chapter Three).

3. Child Interviews

A model of the day care room was used to elicit responses from the children selected. The model contained furniture representative of each setting in the room organized according to whether the child was from Room A or Room B.

The interviews were conducted on the first two days of Time 3, when the space had returned to normal. The model was set up in a separate room to which the children were asked to accompany the researcher one at a time. All conversation with the child was audio-taped, and, later transcribed to facilitate analysis. The interview questions are listed in Appendix C.

Each child was initially asked to identify the model and the areas the furniture represented. The furniture was organized to represent the room in the regular condition. Additional information was given to a child who was initially unable to identify an area. If still uncertain, the child would be told the name of the area being indicated. The researcher then gave the child a small doll, and the child was asked to locate the doll in each area as it was named. This continued until the child placed the doll correctly each time. If the child was unable to identify the model as representative of the day care room or if the child was unable to identify the areas within the model, questioning was discontinued, the child was eliminated from the rest of the study, and another child was chosen to be interviewed.

Each child was questioned as to the size of the classroom presently (in the normal space) as compared to the previous week (in the compacted space). If the child did not state voluntarily that the room was now larger, the child was asked directly whether the room was now smaller or larger. An incorrect answer eliminated the child from further questioning. When the regular condition classroom was identified as being larger, the interviewer suggested to the child that the model be re-arranged to simulate the room with the compacted area. The furniture of the model was moved and screens were introduced. The child was then asked questions to determine the preference for the smaller or larger space and to indicate where he preferred to play in the smaller or larger space.

4. Staff Interviews

Within a few days of the room being returned to its normal area, each staff person from Room A and Room B was interviewed individually.

After presenting the initial categories, the interviewer acted to maintain continued response, making appropriate comments and non-verbal gestures. Specific questions were asked to clarify a point or as a reminder if an area had been omitted. The staff member was encouraged to talk as long she chose.

All responses were audio tape recorded. The list of questions is provided in Appendix D.

Data Analysis

1. Room and Child Scan

All data collected in the room scan and the child scan were processed to provide frequency and percentage scores for the categories studied. Group mean scores were organized in tables.

Data for some of the days of observation in the compact condition were eliminated from the analysis because of a drop in attendance. This drop caused the density ratios for those days to overlap with the density ratios in the regular condition. Two days in Room A, and seven days in Room B with ratios less than 4.45 m^2/child were dropped. This drop in attendance did not occur in the control room. See Dill (1980) and Fishburne (in preparation) for a more detailed discussion.

2. Child and Staff Interviews

Two reviewers listened to the recordings and transcribed the tapes. The children's responses were tabulated under categories corresponding to the questions asked. For the staff interviews, categories were derived from the interviews which were then used to categorize the data. This technique is described in Bussis, Chittenden and Amarel (1976). Data is reported in the form of a summary of responses.

PROJECT FINDINGS

A summary of the findings from the room scan and the child scan will be presented here. More detailed discussion of these findings may be found in Dill (1980), and Fishburne (in preparation). The complete discussion of the child and staff interviews is presented in this report.

Effect of Variation in Spatial Density/Room Scan Data

To determine if variations which occurred in the children's behaviour could be attributed to changes in spatial density, behaviour patterns which occurred in the control Room, Room C, were compared with those in the experimental rooms, Room A and Room B. In general, patterns of behaviour were very stable and few differences of more than 5% occurred. The differences which did exceed 5% were considered to be of note and were discussed.

1. Setting Use

Although wide variations in setting use occurred in all three rooms, the variations which occurred in the control room were similar in size and direction to those which occurred in the experimental rooms. In all rooms the same centers were used most frequently. See Figure 1, page 18. Patterns of setting use were largely influenced by sex with males consistently showing high levels of use of the Block Area and females showing high levels of use in the Craft Areas. Older and younger children showed similar setting use patterns.

2. Setting Specific Behaviours

A high level of setting specific behaviour was found when the activities within each setting were observed. This finding was consistent across density conditions, across rooms, and across sex and age groupings.

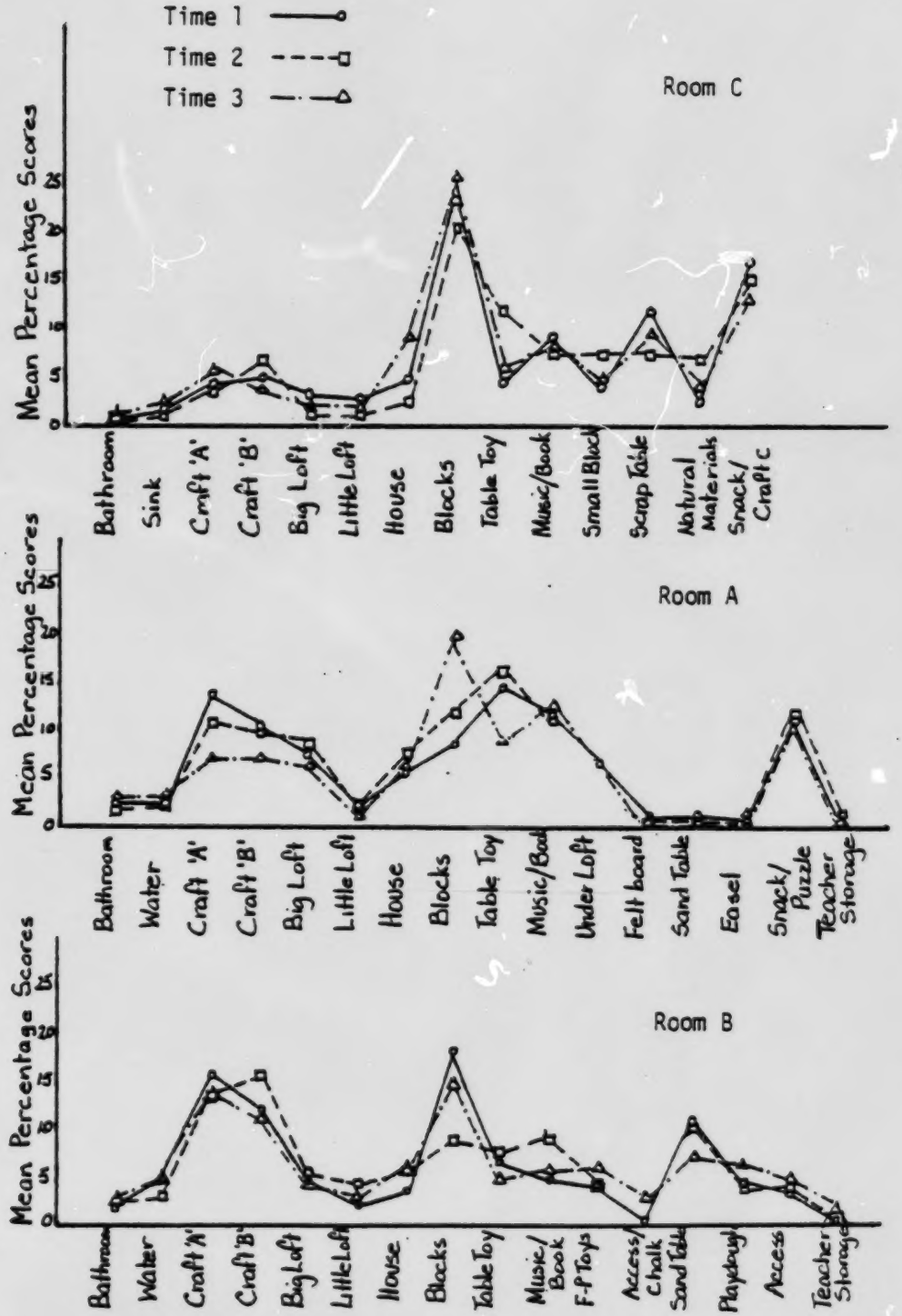

Figure 1. Mean percentage scores for setting use for the total group in Room A, Room B, Room C for three time periods.

3. Social Interaction

Social behaviour was coded into three interactive categories: solitary, parallel, and group, as well as two related categories: watching and transitional behaviour. The patterns of social behaviour were similar in the control room and the experimental rooms suggesting that there was no direct influence of variations in density on children's social behaviour (See Figure 2, page 20). Individual data showed that there were wide variations between children and across time for individual children in the categories of social behaviour in which they engaged. Children were involved in group interactions the majority of the time with solitary and parallel behaviour accounting for a smaller percentage of the observed behaviour. Watching and transitional behaviour were coded only a small proportion of the time. Minor modifications in this pattern were seen between rooms, and in differing sex and age groupings.

An analysis of social interaction categories by setting indicated that the amount and variation of social interaction within settings followed the amount and variation of setting use. This was consistent across rooms and independent of density. Categories where patterns were inconsistent most frequently were solitary and transitional behaviour. This occurred in both the control and experimental rooms.

4. Summary of the Room Scan Data

Variations in spatial density seemed to have no recorded effect on setting use, setting specific behaviour, and patterns of social interaction. The variations in behaviour which occurred in the control room were similar to those found in the experimental rooms. Some effects for sex, age and individual children were noted. The major differences in scores were the effect of different rooms. For details of these findings see Dill (1980, Chapter 4).

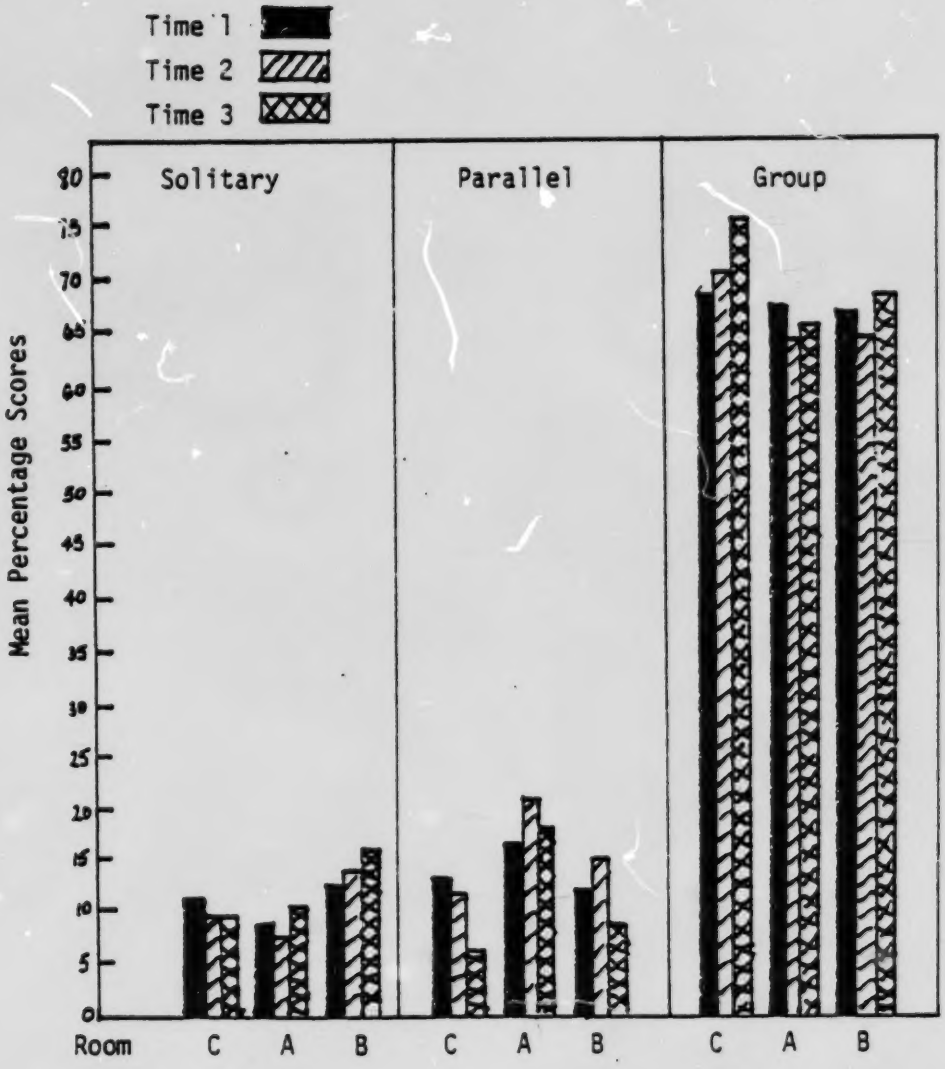

Figure 2. Mean percentage scores for social interaction for total groups in Room A, Room B, and Room C, during three time periods.

Effects of Variation in Spatial Density/Play Category Data

To determine if variations which occurred in the experimental rooms were attributable to the effects of the density change, changes in scores for the control rooms were used as a criterion for the probable range of variation that could be expected without density change. Only variations which exceeded these ranges was discussed. Findings presented here should be considered tentative as the play categories data is still being analyzed and some figures and findings may be changed.

1. Social Play Categories

Variations in spatial density had only a limited effect on the children's social play behaviours (see Table 3, page 22). However, there appears to be an effect of spatial density on parallel play with language (see Figure 3, page 23) and non-play behaviour. This effect was seen mainly in the afternoon. Experimental rooms displayed opposite effects for sex for parallel play with language during the higher density condition (see Figure 4, page 24). The older children in Room A and Room B displayed more co-ordinated play in the high density condition; whereas the younger children in Room A displayed less co-ordinated play and the younger children in Room B showed less parallel play with no language during the high density condition than during the regular low density condition. Variations in scores between rooms and room effects on sex and age indicate little effect for density.

2. Cognitive Play Categories

Generally the change in spatial density had only a limited effect on children's cognitive play behaviours (see Table 4, page 25). There was some evidence of a decrease in the time spent in constructive play (see Figure 5, page 26), again in the afternoon, but it was not clear whether the decrease was the result of variations in spatial density or whether a room effect was operating. The older children in Room B displayed an increase in the time spent in testing/contesting play during the high density condition.

There were differences in the amount of cognitive play based on sex and age. Males displayed more exploratory/functional play and more imitative/dramatic play than females. Females displayed more constructive play than males. Younger children generally displayed more exploratory/functional play.

3. Effect of Return to Low Density

Generally, there was only a very limited subsequent effect of high density on the social and cognitive play behaviours in the experimental rooms when the space was returned to normal. The effect was apparent for solitary play for males in Room A and females in Room B, for parallel play with language for females in Room B, and for parallel play with language and co-ordinated play for males in Room B. There was also an effect for non-play for all children in both rooms.

Table 3

Mean Percentage Scores for Social Play and Non-play For Younger and Older Children within each Room over Three Time Periods

		Older Room			Younger Room		
Time Period	Social Play	A	B	C	A	B	C
1		12.9	8.8	12.1	17.8	12.3	11.1
2	S	10.6	11.3	14.5	17.8	17.7	8.4
3		12.9	8.9	10.4	17.8	19.8	16.7
1		6.1	9.5	15.4	9.0	13.6	16.3
2	P-	9.2	7.8	10.4	12.5	8.9	13.0
3		10.5	10.7	13.4	14.5	9.1	13.9
1		25.7	25.8	30.6	21.5	20.8	19.5
2	P+	18.6	23.6	23.3	18.2	17.0	21.0
3		21.4	29.3	26.2	17.7	17.9	24.7
1		22.0	23.2	24.0	16.6	24.8	21.5
2	C	25.5	27.3	23.9	12.7	24.2	23.2
3		22.8	24.1	19.7	18.8	26.3	18.4
1		30.6	27.2	23.9	29.2	26.3	28.9
2	NP	31.7	28.5	25.4	33.4	31.3	30.9
3		23.0	23.8	29.1	27.5	25.6	25.0

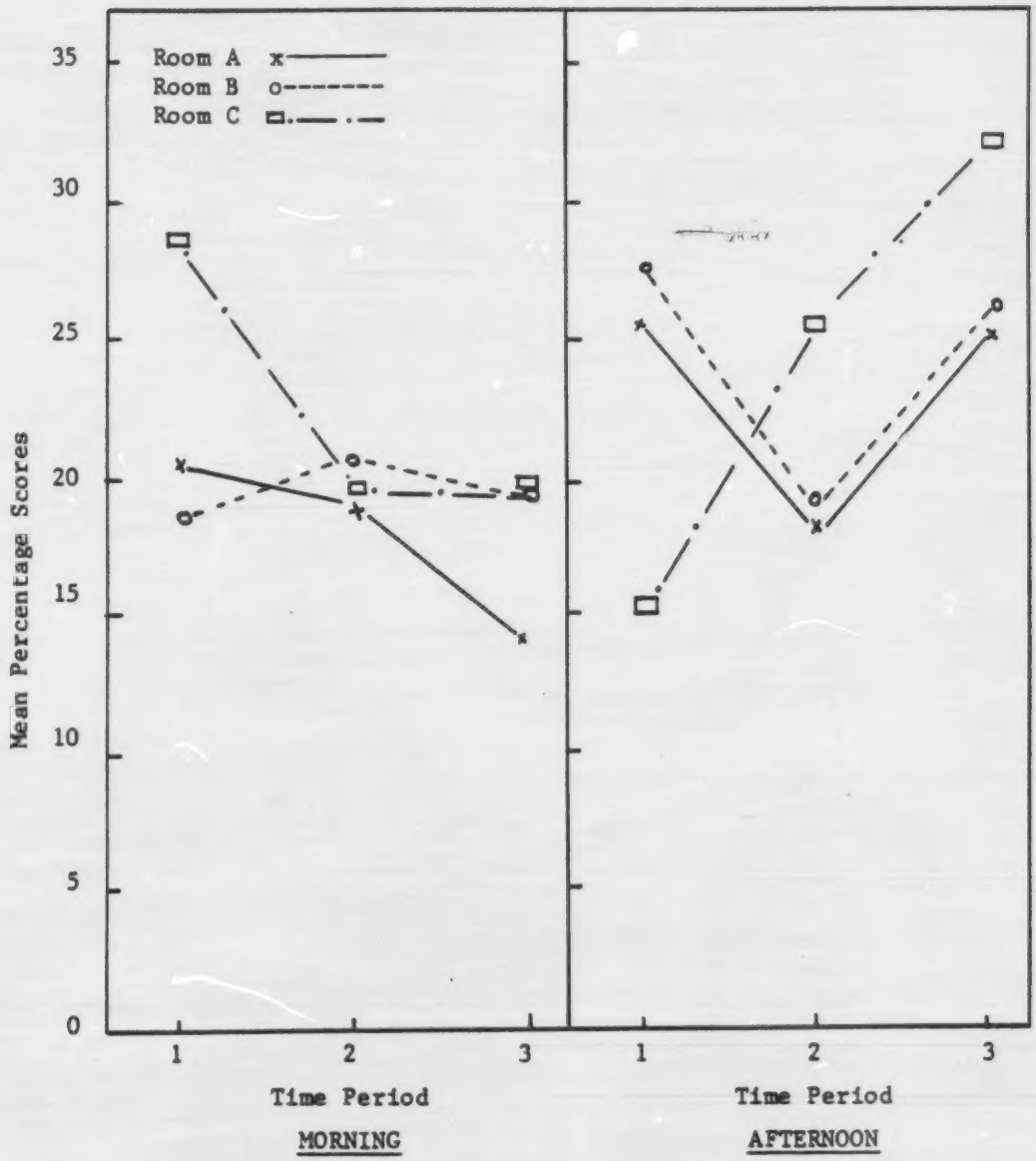

Figure 3. Mean percentage scores for parallel play with language within each room for morning and afternoon over three time periods.

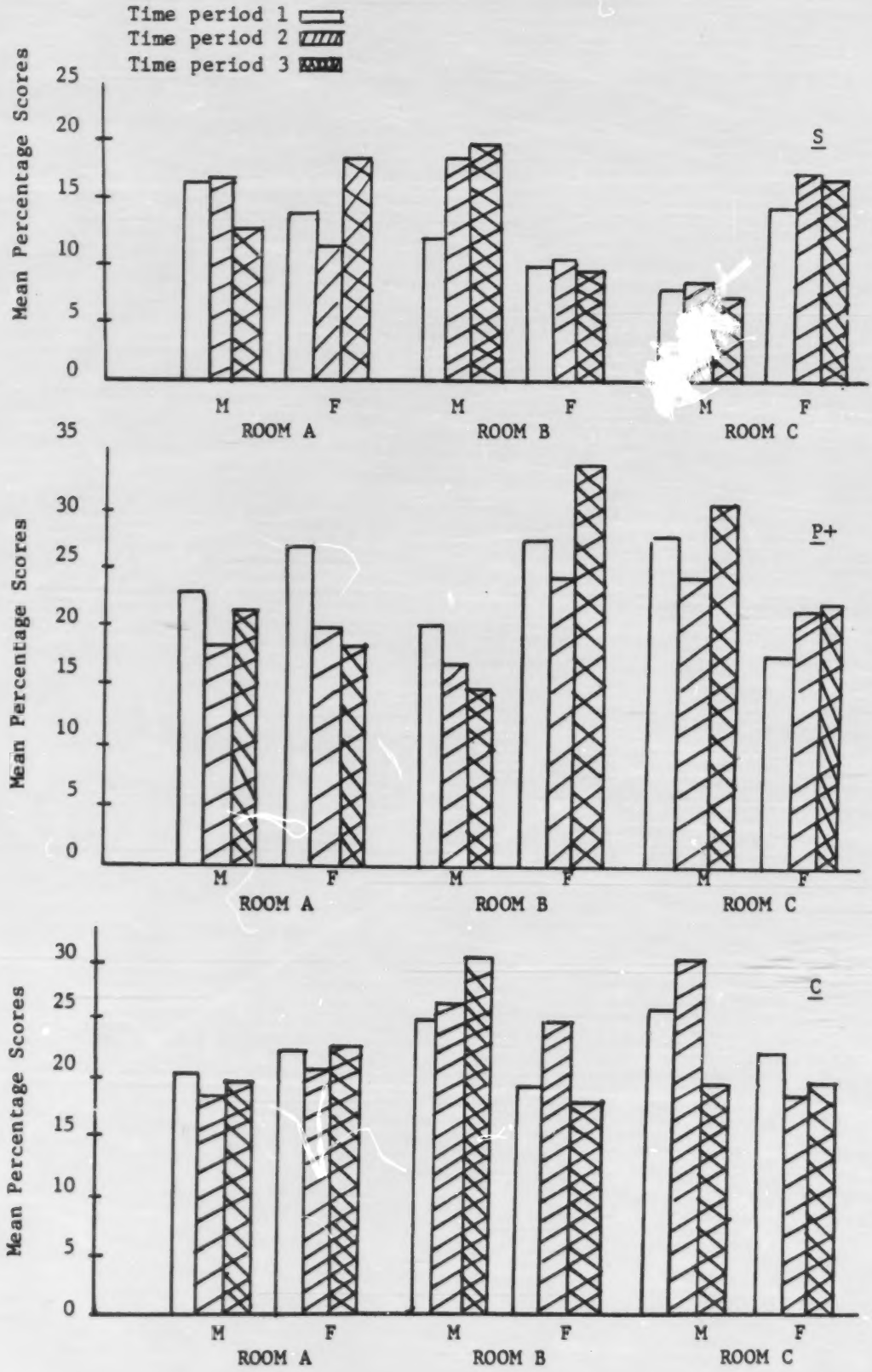

Figure 4. Mean percentage scores for solitary play, parallel play with language, and coordinated play for males and females within each room over the three time periods.

TABLE 4

Mean Percentage Scores for Cognitive Play within each Room over Three Time Periods

Time Period	Cognitive Play	A	B	C
1		5.3	9.7	9.2
2	EF	5.0	9.3	8.2
3		7.5	12.4	7.2
1		32.3	24.6	33.4
2	C	26.6	21.4	29.6
3		30.1	22.5	26.6
1		23.8	35.0	28.1
2	ID	27.1	34.3	30.1
3		26.8	35.0	34.0
1		4.7	1.8	2.2
2	TC	4.8	4.3	3.7
3		3.4	3.1	3.7

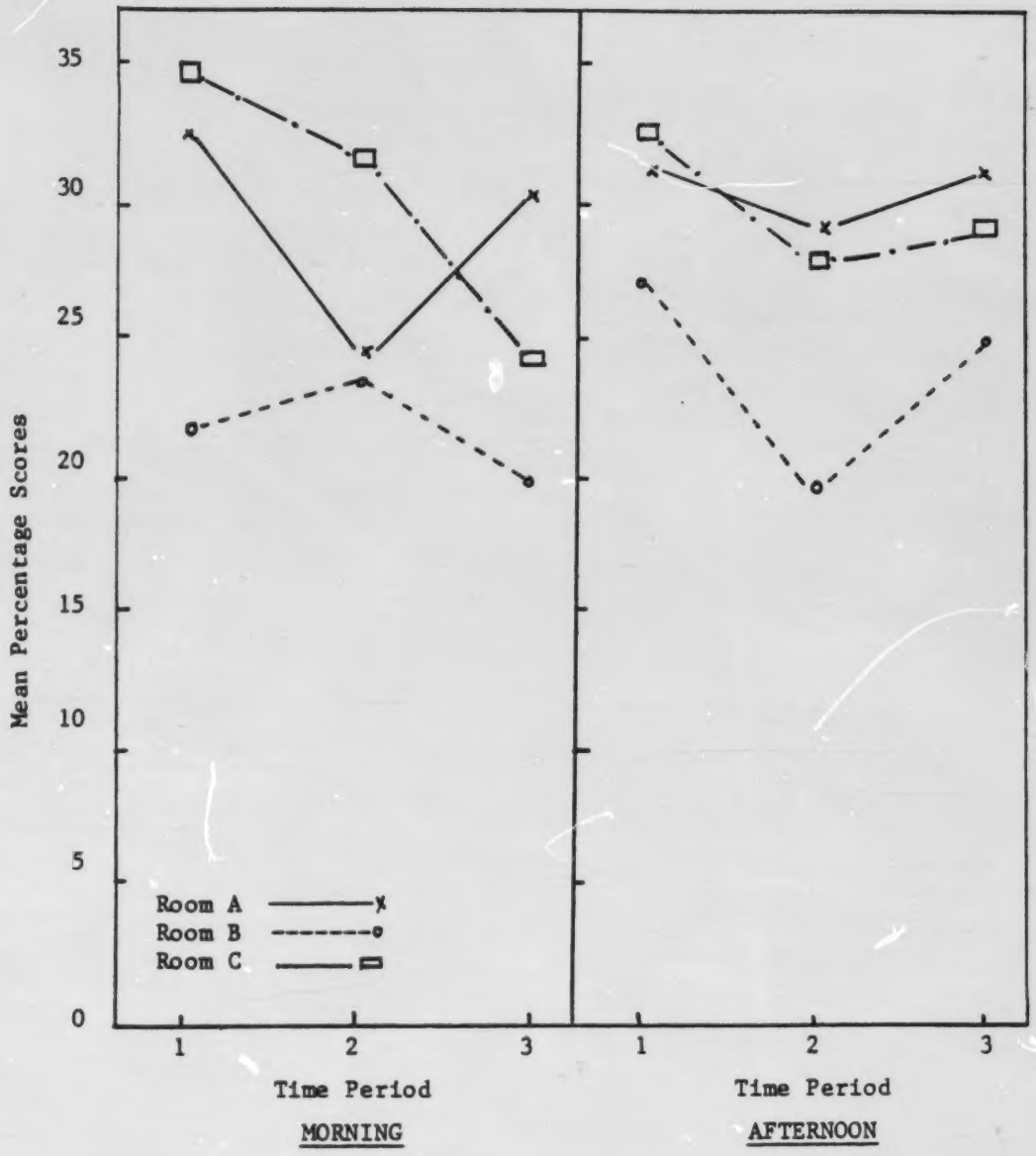

Figure 5. Mean percentage scores for constructive play within each room for morning and afternoon over three time periods.

4. Summary of Child Scan Data

The variation in spatial density had only a limited effect on the social and cognitive play categories exhibited by children in a day care center. Other variables which seemed to have a stronger influence in determining children's behaviour were sex, age, and time of day with room providing the strongest effect. For details of these finding see Fishburne (Chapter 4).

Children's Perceptions of Change in Spatial Density

The findings of the child interviews will be presented in two parts. First the usefulness of the model in eliciting responses from the children will be discussed and then the children's responses with regard to spatial preference will be presented (Table 5, page 27).

Use of the Model

The model was a useful means of representing the day care classroom, particularly for older children (4.5 years and older). A third of the children (4) were able to identify the model as representative of their room and to describe the changes which had been made without prompting. One-half of the subjects were able to identify, the changes made when prompted. Two of the subjects, one older and one younger, were unable to relate sufficiently to the model or to the changes in the room area to be able to answer questions related to the model.

There was no difference in the number of males and females who answered without prompting, or who were unable to respond to the model. More older children than younger children were able to answer without prompting.

Spatial Preference

Ten children were interviewed as to their spatial preference. Detailed responses are provided in Appendix E. Half of the children responded consistently and half responded inconsistently. Of those responding inconsistently, they sometimes indicated a preference for the room when it was smaller and sometimes when it was larger. Of the five children who responded consistently, three preferred the

Table 5. Interview Responses of Children in Room A and Room B

		Response to Model			Spatial Preference						
	No. of Responses	Recognized Difference Between Large & Small Area	Needed Prompting	Did Not Recognize Difference	No. of Responses	Consistent		Inconsistent		Combined	
						Large	Small	Most Frequent Large	Most Frequent Small	Large	Small
Male	6	2	3	1	5	2	0	3	0	5	0
Female	6	2	3	1	5	1	2	1	1	2	3
Total	12	4	6	2	10	3	2	4	1	7	3
		.33	.5	.17		.3	.2	.4	.1	.7	.3
Younger	6	1	4	1	5	1	1	3	0	4	1
Older	6	3	2	1	5	2	1	1	1	3	2
Total	12	4	6	2	10	3	2	4	1	7	3

larger area and two preferred the smaller area. Of the five children who responded inconsistently, four responded more frequently that they preferred the larger area and one more frequently preferred the smaller space. When the consistent and inconsistent responses were considered together, seven children expressed a greater preference for the larger space and three of the children expressed a greater preference for the smaller space.

Using the combined categories there was little difference between older and younger children in their preference for the smaller or larger area. When grouping responses by sex, all the males expressed a greater preference for the larger area. Females were nearly equally divided in their preference for the larger or smaller area.

Examples of the reasons given by the children when expressing a preference for the larger or smaller space are listed in Appendix E. The older children were more articulate in stating reasons for their preference while the younger children would respond more often with "I don't know" or "Because I like it" when asked for a reason for their choice.

The children who preferred the larger area often referred to the lack of space in specific settings such as the Block Area, the House Area, and the Table Toy Area when the space was smaller. They said that in the larger area there was more room and the children weren't bumping into each other or into the furniture. The lack of space was given as a limitation to the kind of play in which the children engaged, particularly in the Block Area.

Some of the reasons stated by the children who preferred the smaller area included the children being able to sleep close beside each other during nap time. Another reason given referred to a specific use of the Block Area during the high density: blankets were hung from the Big Loft down to the floor and one child enjoyed hiding in that area.

Summary of Child Interview Data

The child interview data showed a tendency for the children in

the experimental rooms to prefer the larger area. Because there was some inconsistency of response conclusions can only be tentative in nature. The model proved to be a useful means of representing the child care room, particularly for older children.

Staff Perceptions of the Effects of Change in Spatial Density

The responses by the six staff members in the two experimental rooms are presented under the headings: children's use of space, changes made in programming due to the smaller spatial area, changes in the children's social and emotional reactions, staff reaction to the smaller spatial area, changes noted in staff-child relationships during Time 2, and programming changes they would implement if they were working in a permanently smaller space.

1. Use of Space

Room A

The staff in Room A felt that there were definite changes in children's use of space during Time 2. They noted that the House Area and the Block Area were not used as frequently in the higher density condition as when the children had access to the regular space. One staff member commented that the older children seemed to adopt the Block Area as their private domain to which younger children had limited access. As well, it was noted that children avoided the House Area for any length of time. They only played in it briefly. The Book/Music Area was used as a gathering place for stories and group activities. During Time 2, the staff described the children in this area as being in "layers". There was not enough room for dance or games. It was observed that the children seemed to spend more time under and on top of tables and cupboards. One staff member suggested that this behaviour resulted from the children's need for "space of their own". Centers such as the Water Table and the Table Toys were judged to be used equally both before and during the change in the amount of space.

Room B

The staff in Room B felt that the changes in spatial area caused changes in the behaviour of the children. The comments on setting

usage made by the staff were of a conflicting nature. One staff felt that the Table Toy Area, the House Area, and the Playdough Table were used less in Time 2 than previously. Another staff member felt that the Sand Table, the Water Table and the Craft Tables and the Playdough Table were used more frequently during Time 2. The children found several areas too small and materials normally used in one setting were removed to other settings. One staff member stated that the Block Area was used quite differently in Time 2 than previously. Children built blocks up to the Big Loft and then hid inside. This was seen as an indication of a need for privacy. The same reason was given for increased use of the Book/Music Area. The staff suggested that the children would attempt to become involved in an activity and then become frustrated by the lack of space. Then the child would go to the Book/Music corner where there was still some space to be on one's own.

Program Changes in Time 2

Room A

Program changes which occurred in Room A during Time 2 centered on activities which required large amounts of space or small groups. Dramatic activities, dance and games and science activities were limited because of lack of space. It was also difficult to divide the children into small groups as there was no space for the groups to work without disturbing the others.

Room B

In Room B, the staff mentioned that in Time 2 it was difficult to do small group work and that large group time for games and large motor activities was eliminated. Themes were cancelled because lack of space restricted the type of activities which could be set out. Art activities were curtailed. Several staff noted that increased planning was necessary. They also spent more time tidying.

Social and Emotional Behaviours

Room A

The children were observed to interact more in the smaller space:

conversations were still occurring and the children played together. It was noted that more of the interactions involved fighting and agonistic behaviour. Struggles for power were intensified.

All staff members in Room A felt that there was more aggression and more fighting between children. Some of this was due to a lack of physical space. When the children would try to build in the Block Area, they would bump into each other and cause a fight. The effect on children who were described as having low frustration levels or who were particularly active was apparent to the staff. These children seemed to show increased aggression, have more arguments, and confrontations, and have more temper tantrums. Children who were seen as having problems in their ability to deal with social situations or in their emotional control regressed during the higher density condition. One staff member commented that the reactions of the children with behaviour problems were beginning to affect the children who were more normal.

Room B

The staff in Room B suggested that social interactions changed in Time 2. The children seemed to stay in larger groups and to centralize in a few settings. In the Table Toy Area, which was considerably smaller than usual during Time 2, groups of five or six children would try to play with one set of equipment whereas, previously, smaller groups of children would play with different materials.

All staff commented that there were more disagreements and fights. They found the children noisier and more active. When two children had an argument, because of the close proximity of the other children, many more would become involved. This "ripple effect" was described by several staff members.

Behaviour

Room A

The staff had mixed reactions to the effect of the smaller spatial area on themselves. Two of the staff members suggested that the smaller space and the closer proximity to children allowed the staff to be more aware of what was happening in the child care room.

The staff were able to "zero in on problems before they got out of hand". But this increased proximity increased the demands of the children on the staff and this was described as emotionally draining. The staff felt increased tension and fatigue at the end of the day. Feelings of being "hemmed in", "caged", and "cramped" were noted. The higher noise level in the room was noted by all the staff and they suggested that this added to the tension. One staff member felt that over an extended period, the smaller area would lead to less patience in interactions with children and a higher staff turnover. Another staff member stated that she would not like to work in the smaller area, even with fewer children.

Room B

All staff found the smaller area frustrating and expressed a preference for the larger area. Two of the staff commented that they felt more tired than usual at the end of the day. One felt she was more irritable with the children and was harsher with them than normally. The days were described as more hectic, and the staff were busier because of the increased need for intervention in disputes. The smaller area required more care in planning and organization. One staff member said she was often bored during Time 2 because it was more difficult to work with small groups as she usually did. A positive comment from one staff member about the smaller area was that it was easier to keep an eye on the children and to be aware of their activities.

Staff-Child Relationships

Room A

Staff-child interactions increased during Time 2. The children demanded more attention from the staff and staff members intervened in disputes more frequently. Generally it was hoped that children would try to solve their own disagreements, but during Time 2, staff would intervene more quickly so that disagreements wouldn't spread to include bystanders. One staff member noted that it was necessary to change her method of working with the children. More time was spent in managerial tasks and less time was available for the staff to act as resource people and initiators.

Room B

The staff in Room B noted that the smaller space made it difficult to interact with the children on an individual basis. The comment was made that as soon as you took one aside, several other children would join in. There were increased interactions between the staff and the children but as one staff member said, "They were not always positive interactions; there were negative ones, too". Several staff commented that the relationship between staff and children changed. More direction was given in terms of the activities selected. The children seemed to find it more difficult to settle into an activity and more teacher direction was necessary to focus their attention.

Recommended Program Alterations

Room A

All the staff in Room A stated that they would remove some of the furniture and some of the equipment if the room size were permanently reduced. One staff member suggested that furniture would have to be multi-purpose. All staff suggested that the program would have to become more teacher-directed or, as one staff member described it, "more rigid". There would be more whole group work and less individual and small group activities.

Room B

If these staff members were working in a room of a smaller area all the time, they all stated that they would remove some of the furniture and equipment. It was suggested that some of the materials and equipment would be presented on a rotating basis. Smaller pieces of equipment, tables and cupboards would be substituted by one staff member. Several staff members suggested that programming changes would be inevitable because some activities would not be suitable for the smaller space. One said that there would be less free play time, more "sit down" work, and more group activities. More teacher direction would be involved.

Summary of Staff Interviews

The staff were unanimous in their preference for the larger area.

The strongest responses during Time 2 were in the emotional reactions by the children and in the staff reaction to the smaller area. Changes in use of space, in programming, and social interaction occurred to a lesser extent. All staff felt that changes in programming and space would be necessary if the smaller area was permanently available.

DISCUSSION OF THE FINDINGS

The purpose of this research project was to examine the relationship between the behaviour of children in a group day care centre and variations in spatial density. The project was planned to involve both quantitative and qualitative measures of children's behaviour in order to provide the most complete sources of information. The conclusions and implications which result solely from the room scan data and the child scan data are not dealt with here but are described in detail in Dill (1980) and Fishburne (in preparation). In this section the results from all four segments will be discussed as they apply to each variable studied.

Spatial Density Effects

1. Use of Space

The room scan data were unable to provide conclusive evidence that variations in density between the range of 3.5 and 6.2 m^2/child influenced setting usage patterns. The variations which occurred in the control room in setting usage were similar to those which occurred in the experimental rooms. In the interviews with the staff, they noted changes in setting use patterns as a result of the space change; however, these were not confirmed by the room scan data. This study did provide evidence of a wide variation in scores for space use depending on the time period selected for measuring.

2. Setting Specific Behaviour

The highly coercive power of setting over behaviour was confirmed

in this study. Setting specific behaviour accounted for a minimum of 95% of the children's behaviour regardless of density. In the staff interviews in Room B, it was noted that the children removed materials from one setting to another more in the high density condition. This would have been coded as non-setting specific behaviour and there was no indication of an increase in non-setting specific behaviour in the high density condition. Apparently the amount of removal were not sufficient to be noted by observers, or did not occur during the observation periods.

3. Social Interaction/Social Play Behaviours

Social interactions as noted by the room scan remained very stable during the data collection period for the group data. Individual data for certain children showed much greater variations which may have been influenced by the spatial density change. The child scan data did note limited difference in social play categories as a result of spatial density change. The children in both Room A and B spent less time in parallel play with language and more time in non-play during Time 2. Other factors such as room, time, and age, were also important in influencing behaviour. The children appeared to be more sensitive to the high density situation in the afternoon than in the morning. In the high density situation the younger children spent more time in social behaviours at a lower develpmental level. The staff interviews suggested that there were more interactions and that it was more difficult for the children to play alone in Time 2. Younger children were observed as finding it more difficult to engage in interactions and seeking teacher support more frequently in the high density condition. One staff mentioned that by late afternoon the children couldn't find anything to do. They wandered around. This may correspond with the data found in the child scan which indicated that there was much less parallel play with language in the afternoon during Time 2 than during Time 1 or Time 3. These findings might be interpreted as suggesting that there is an interaction between density or crowding and length of time in that condition daily. This has implications for part versus full day programs.

4. Cognitive Play Behaviour

Variations in the constructive and testing/contesting categories of cognitive play appeared to be influenced by changes in spatial density. No differences were found for exploratory/functional or imitative dramatic play. This is contradicted by the observations of the staff who noticed a decrease in creative dramatics during Time 2. This was related to play in the House Area and the Block Area. The staff observed less play in these areas where much creative drama occurs. This discrepancy may be explained by a difference in the quality rather than the amount of dramatic play. Quality is not measured by the child scan coding.

5. Effect of a Return to Low Density

The child scan data indicated that a period of higher density had little subsequent effect on children when the density was returned to normal. Only for a few patterns of behaviour were scores substantially different when Time 1 and Time 3 were compared. This situation was also found in the room scan data. The cases where there were substantial differences cannot necessarily be attributed to the effect of the high density because these variations also appear in the control room. The staff interviews support the return of normal behaviour patterns when the regular spatial area was available except for reporting initial novelty reactions on the first day or two.

6. Spatial Preference

The data from the child interviews indicated that most of the children preferred the larger space. It was easier and more fun to play in the large space. There was some inconsistency in their responses which may indicate that the smaller space does have some advantage, for example, children can sleep closer together and certain activities occurred in the smaller space that did not in the larger space. Adult interviews yielded the same results though there was no inconsistency. All staff preferred the larger space, though it was noted that there were some advantages in the smaller space, specifically a greater awareness of the children's activities. This might suggest the need for arranging for some periods of closer contact

between children and staff, or deliberate structuring of observations of children. Alternatively, the nature of the children's behaviours might simply have been more intrusive during this time.

7. Program Changes

The staff indicated that changes in the program occurred during the high density condition. Activities which involved large groups were avoided, as well as simultaneous small group work where several staff were working within the day care room. The staff also described changes which they would make to their room and to their program if the spatial area available in the high density space was permanent. Room organization changes focused on the removal of equipment and furniture to make more floor space. Program changes focused on more directive child-staff relationships, more whole group activities and less individual attention. These responses suggest the need to consider organizational factors in response to the child-space ratio.

8. Summary

The results from all segments of the research project indicate that the quantitative and the qualitative data present very different pictures as to the results of variations or spatial density on children in a day care centre. When the results are considered several factors should be kept in mind. Because of the variation in the number of children present during the data collection period, not only did the children experience a change in spatial density but also in social density. As well, the mean density levels which were achieved during Time 2 ranged from 3.5 to 3.8 m^2/child. According to the advocacy literature in the field, any of the density levels used in this study would be considered adequate for children in preschool groups. It is difficult then to attribute variations in behaviour to changes which occurred in density or child to space ratios. Probably they should be related to changes in the total amount of floor space.

Other Variables

Other variables which were involved in this project were the

effects of room, age, and sex on the behaviour of children. Results from the four research segments on these variables will be discussed.

Room

Room, which includes characteristics of staff and children, was one of the most influential variables when variations in behaviour were examined. The patterns of behaviour which occurred in each room were strikingly different despite the common physical characteristics and similar staff ratios, training and experience. This was noted for both the room scan and the child scan. This would suggest that specific configurations of staff and children are influential features of the environment. The social environment established by staff and children was a stronger factor in determining behaviour than the physical change in space.

Sex

Differences based on the sex of the children involved in the study were found in many areas. The room scan found sexual differences in setting usage. Males used the Block Area more and females used the Craft Areas more. This pattern had been found previously by researchers (Rubin, 1977; Shure, 1963; Tyler, 1975). The child scan found that there were sex differences in the social play categories in which children engaged. Males spent more time in solitary play and coordinated play, than females, whereas females spent more time in parallel play with language. Sex was a factor in children's cognitive play with males displaying more exploratory/functional play and more imitative/dramatic than females.

The child interview segment showed that males all preferred the larger space while females were split in their preference. Other research has reported that males range more widely in space and this may cause boys to feel the effects of confinement more strongly. These differences in play suggest the need for continuing efforts to broaden children's play experiences in order to be certain that the different types of learning obtained through different types of play is available to all children.

Age

The children in this study were divided into two age groups. Those who were younger than 4.5 years were labelled "younger" and those who were older than 4.5 years were labelled "older". Several differences were noted on the basis of age. While there did not appear to be any direct effect of density on children according to age, the room scan data across all the times noted that setting usage was influenced by age. Younger children appeared to use constructive and manipulative toys more while older children showed a preference for arts and crafts activities.

Differences were also noted in social interactions. Younger children were involved in more solitary and less group behaviour. Using the social play categories from the child scan, it was noticed that older children spent more time in parallel play with language and younger children spent more time in solitary play and parallel play with no language. In the cognitive play behaviours younger children were involved in more exploratory/functional play than older children.

Staff interviews often focused on age when describing the children's behaviour during Time 2. The older children were described as more aggressive while the younger children were often described as withdrawn.

These findings suggest that differences in age interact with the amount of space available. Younger children appear to be more affected by the reduction in space. One explanation may be that older children enlarge their space by pushing the younger children to the fringes. This may suggest a need to avoid mixed-age groupings in higher density conditions.

Time

The child scan data focused on the effects of time by making observations in the morning and the afternoon. In the afternoon there were lower percentages of parallel play with language and non-play during the high density condition. No differences were found in cognitive play categories as a function of time. One staff member

noted that by the afternoon the children were very tired, found it difficult to become involved in activities and wandered more. As previously noted, this has implications for different requirements for part-time and full-time programs.

Summary

The results from this research study indicate that many factors influence behaviour. Because of the unexpected drop in attendance the desired increase in density did not occur, and little can be said about the effects of variations in spatial density. There was a variation in spatial area which resulted in several noticeable changes in behaviours. Examining this problem from both a quantitative and qualitative perspective allows a more complete investigation, but it becomes apparent that there are factors operating other than space.

The similarity between the behaviour in the control and experimental rooms as noted by the room and child scan data suggests that actual amount of space, at least within certain limitations, may not be a significant factor in the determination of children's behaviour as long as the number of children in the space is reduced proportionately. Still, spatial area may have indirect effects on children's behaviour in that certain types of program decisions will be made as a result of the availability of sufficient space. This was strongly pointed out when all staff suggested that furniture and equipment would have to be removed in a smaller spatial area. These conclusions correspond with the findings of Kritchevsky, Prescott and Walling (1969) that it is necessary to have at least one third of the floor space uncovered in order to provide ease of movement.

Several staff suggested that rotation of settings would be one way in which to deal with a smaller spatial area. An examination of the implication of this decision is necessary to understand what needs to be considered in a preschool room. The room scan data indicated that there were approximately six settings which received the majority of use yet all settings were used by some children at some point. When settings are eliminated choice is being curtailed, the number of children in each center increases, and the ability to meet the

individual needs of the children is limited. These factors may be particularly salient when dealing with children in multi age groupings. Younger children who play more frequently in solitary or parallel play may have developmental needs for the choice to be alone, or to play alone near others, while not having to play with others. These choices are not possible in the crowded condition.

If the settings were not removed, then setting size must be reduced. Shure has suggested that popularity in terms of setting use is related to the size of setting. In her study the Block Area was the largest and the Book Area was the smallest in physical size. In the present study, in all conditions, the Block Area and the Book/Music Area were the two largest settings in all three rooms. The craft areas which received extensive use were much smaller in size. The physical size of a setting may only be one factor which contributes to the attractiveness of a setting. An interrelationship between size and activity may be an important factor in determining setting preference such that a setting which is sufficiently large to accommodate the activities associated with it contributes to the attractiveness of that setting. Settings which are reduced in size may limit the activities which may occur in them to the point that the purpose of the settings is circumvented. In Time 2, the small size of the Block Area limited certain types of construction activities such as making large vehicles and buildings. This restriction severely limited the scope of the activities which could occur.

Decreased space with or without a corresponding decrease in population means increased stimulation simply because of the greater proximity to others. The increased stimulation means that privacy may be more difficult to maintain. Ittelson, Proshansky, Rivlin, and Winkel (1974) describes privacy as the optimum balance between the "information" which comes to a person and that which he puts out. Smaller spatial area seems to imply greater information exchange and less opportunity for privacy. This may be particularly important for children in day care who spend large amounts of time with many children and have little escape from this stimulation. One means of dealing with this situation is to use barriers and partitions to

spaces for children. Rohe and Nuffer (1977) found that the effect of increased density in children was mediated and reduced with the introduction of partitions.

The condition with the smaller area had a strong effect on the staff. They all preferred the larger area. One comment that was made by several staff members was that there was a higher noise level, increased contact between staff and children, and more organization and planning required in the smaller spatial area. This increased the stimulation and the workload for the staff which resulted in increased fatigue, tension, and irritation. One staff member suggested that a permanently smaller space could lead to increased staff-child interactions of a negative nature and increased staff turnover as job satisfaction lessened. Perhaps the low density at this center was responsible for several of the staff members having stayed at the center for the eleven years since the center opened.

Several staff members suggested that in a smaller space the role of the teacher would be more directive and that there would be less opportunity for children to make activity choices. Fagot (1977) reports this to be true in more crowded schools where teachers were more directive. Perry (1977) also found that teachers in classrooms with less than 2.9 m^2/child were more directive than teachers who worked in lower density rooms. The effect of variations in density on teachers' behaviour may indirectly influence the behaviour of children.

The effect of time on the activities of the children in the day care center has important implications. The majority of the research on density has occurred in preschool settings where children attend half-days. If the tolerance level for excess stimulation declines as the length of time in the situation increases, then density levels for preschool situations can not be applied to day care environments.

Individual patterns of behaviour were found to differ substantially. Staff members also described individual children who appeared to be more affected by the variations in space. This suggests that individual characteristics have a mediating effect on environmental factors such that the behaviourial response to environmental stimuli

is unique. The staff also described the ripple effect when certain conflict behaviours of the children spread to those not originally in the conflict. In this way the effect of the variation in space on specific individual children affects the whole group.

A significant occurrence in this study was the marked drop in attendance in the two rooms when space was compacted. This did not occur in the control room. Before undertaking the study, the researchers had checked past years of attendance records to ensure that attendance remained stable during the observation period. When the drop in attendance became evident, the director of the center undertook to contact all the families with an absent child to ascertain the cause. No discernible common pattern of reasons occurred and no parent offered an explanation pertaining to the crowding. Several children in one room were reported to have mild illnesses. Speculation on the reasons for the unexpected and marked drop in attendance, leads to the possibility that the compacting may have created additional stresses which resulted in the illness, or that children where possible simply elect to take themselves out of settings in which they are too uncomfortable.

The conclusion which can be drawn from this research project is that variations in the amount of space affect the staff perceptions of children's behaviour and have a limited effect on specific behaviours for certain children. No conclusions can be drawn with regard to minimum levels for spatial density because the density levels were all above those considered adequate and the effect of variations in spatial density were confounded by variations in social density as well.

IMPLICATIONS FOR DAY CARE PRACTICE

1) The outcomes of this study afford limited support for the minimum space ratio of 3.36 m^2/child proposed by the Canadian Council on Social Development, and required by the City of Edmonton. However, the findings suggest the difficulty of securing quantitative data in support of an optimal space/child ratio. Within a range of mean ratios of 3.5 to 6.2 m^2/child there was no significant change in the child scores. Qualitative data provide a different story. At ratios

below 4.5 m^2/child, the staff perceived both themselves and the children to be exhibiting undesirable behaviours. Furthermore, more of the children interviewed preferred the larger space. Evidentally, the quantitative data do not capture the effects of the change. Support for this as a reasonable conclusion is provided in studies where qualitative differences have been reported to occur in both solitary and dramatic play. These differences were not measured by the instruments used here. Alternatively, the quantitative data may represent too limited a time base on which to base a decision. The staff reactions are based on a much broader time and experiential range. The quantitative data was focusing on phenomena which did not change; the qualitative data was focusing on phenomena which did change.

2) When determining minimal space standards for a day care program, it may be important to set limits to the actual amount of space as well as to the density within the space. The actual spatial area appears to affect all aspects of a day care program.

3) When working in a smaller spatial area, it is important that the effect of setting organization be considered in determining children's behaviour. Centers which induce a variety of behaviours should be included to provide children with opportunities for solitary, parallel, and group pursuits. Settings should be chosen to respond to the needs of the age and sex of children served. Also to be considered is the appropriate organization of settings to accommodate the behaviour expected within the setting. Size and equipment organization may affect the types of behaviour which occur in settings.

4) The response of teachers/staff members to density of the room should be considered. High density conditions may induce more directive behaviour from staff members. Increased tension, fatigue, and irritation may alter staff-child relationships.

5) Individual characteristics of children should be considered when planning day care environments. Different needs of individuals may require different types of space. A wide variety of spatial settings will ensure that children are able to make selections according to their individual needs.

6) The effects of spatial density and the time of day on staff and children should be considered. There should be a concern for meeting the needs of all the children in a full-time day care program, especially those in centers of higher densities. There may not be as great a concern for part time day care programs.

7) The effects of spatial density and age should be considered. Programs that include younger children may need to be concerned with optimal space requirements. The staff need to become aware of some ways of assisting children younger than 4.5 years of age to cope with more crowded conditions. Programs that include mixed-age grouping need to find means of protecting younger children against the social pressures created by crowded conditions.

IMPLICATIONS FOR FURTHER RESEARCH

1) The findings presented here indicate that the relationship between man and the environment is complex, and not simply unidirectional. A change in the amount of space had only weak quantitative effects though strong qualitative effects. A replication of this study which was able to increase and maintain the density at the desired level, as well as other density levels which have been cited as having relevance to this question, would add valuable insight into the question of whether critical density levels do exist. Studies which use preformed operating groups have difficulty in ensuring that only the planned changes occur. Research which was able to separate the effects of social and spatial density might be able to contribute information which would aid in deciding whether actual amount of space or group size are significant factors in determining behaviourial responses of children.

2) As man-environment relationships are interdependent, it is useful to study questions in the area from two perspectives. It appears that increased density becomes important when an individual feels crowded. To determine optimum density levels for preschool groups, more investigation of varying density from both the objective and subjective perspectives is needed. This approach may also allow an investigator to focus on individual responses to environmental stimuli. The problem

common to both Massing's (1979) study and this project is the difficulty of obtaining subjective information for children who may be unable to communicate fully their perceptions of the spatial environment.

3) The room scan and the child scan methodologies were able to provide reliable information as to children's behaviour. These methodologies identified idiosyncratic differences which appeared to be related to specific child factors such as inability to speak English. This suggests that they are also providing valid information. To provide for more adequate distinctions of the quality of space-use and play behaviours categorization systems should be modified to provide more discrete pieces of information, and perhaps to provide additional categories of behaviour which may be related to environmental stimuli, for example, agonistic and aggressive behaviour. The categories of social interaction, social and cognitive play do not yield an effective assessment of the quality of a category of activity, e.g., dramatic play, and may need to be supplemented in this respect.

4) This study was a response to Massing's 1979 recommendation that data collected over a longer period and over a larger number of children would provide more accurate information with regard to children's spatial relations. In carrying out this suggestion, the project has provided useful information on the amount of normal variation which can be expected in individual and group scores over a lengthy period of time. It has added to the information on children's use of settings and the effects of settings on behaviour. It has provided additional information on children's play behaviours and the factors which act to create differences in these.

Indeed, the variations in the means across time periods and room suggest that extreme caution must be used in interpreting the meaning or significance of data based on a more limited sampling for children or time.

The implications of this project's findings may be that still more time and more children are necessary for several reasons. A longer period in the compacted condition may be necessary to allow

children to adapt to the new condition, and to ensure adequate opportunity for attendance at the required level. Larger samples may negate the effects of highly idiosyncratic behaviour which can unduly affect means for small groupings by age or sex. The similarity between the data in the control room and in the experimental room may indicate that data may not need to be collected so frequently.

5) Different responses to environmental conditions, such as density, by children in full day and half day preschool programs should be investigated. As much of the research into density has used children in nursery school programs as subjects, a comparison of responses from both types of programs would enable one to make judgements as to the applicability of research in half day programs to full day programs and vice versa.

6) There are many variables operating in the child-environment interaction. It would be necessary, but probably impossible, to control these variables such as the adult interaction, in order to determine what exactly influences children's behaviour.

7) Investigation into individual responses to variations in density with regard to specific personality characteristics may be valuable in providing children with environments which suit personal needs. It may be that children who are well adjusted socially and emotionally are better able to adjust to high density situations than children with a lower level of ability to adapt and adjust.

SUMMARY

The main conclusion to be drawn from this project is that there are a large number of variables operating to create behavioral differences in children's use of space and play behaviours. Within the density ranges obtained in this study, the interaction of these variables served to create a wide variation in individual and group scores on the categories for use of space and play behaviour. The factors which did serve to create either measured or perceived changes in behaviour irrespective of density included room, age, sex, and individual child differences. Factors operating in the room

effects appeared to be partly attributable to the effect of staff management styles with some effect for differing mixes of peers.

Effects accompanying variations in density appeared to result from a change in area and configuration of the space. Since this change occurred only for some settings, especially the larger ones, these tended to show the greatest change. Novelty effects were probably operating as well especially on the return to the regular space.

The unanimous negative staff reaction to the reduction in space is subject to the possibility of bias as a result of staff's previous experience with the larger space. The failure of the room scan and child scan measures to replicate staff perceptions can be interpreted either as supporting a bias effect for staff, or as resulting from the limitations of the measures or the limited amount of time observations were carried out over the total 10 hour day. The methodologies may not be successful in obtaining a measure of the qualitative changes in behaviour, or they may be measuring behaviours which do not change when density changes. The interview responses may be based on behaviours which do change or effects which are most noticeable in other periods of the day.

The powerful effects of the group environmental setting of the room, and the high occurrence of setting specific behaviour in the smaller sub-settings within the room both serve to support theories of the significant effect of settings on behaviour. The range of scores for individuals and groups across time period indicates the need for considerable caution in undertaking or interpreting research projects with young children.

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APPENDIX A

CHILD SCAN RECORDING SHEET

DATE_____ TIME_____ CODER_____

SET____BEH____ ACT_____ CH 1 SOC____COG____	SET____BEH____ ACT_____ CH 2 SOC____COG____	SET____BEH____ ACT_____ CH 3 SOC____COG____	SET____BEH____ ACT_____ CH 4 SOC____COG____
SET____BEH____ ACT_____ CH 5 SOC____COG____	SET____BEH____ ACT_____ CH 6 SOC____COG____	SET____BEH____ ACT_____ CH 7 SOC____COG____	SET____BEH____ ACT_____ CH 8 SOC____COG____
SET____BEH____ ACT_____ CH 9 SOC____COG____	SET____BEH____ ACT_____ CH 10 SOC____COG____	SET____BEH____ ACT_____ CH 11 SOC____COG____	SET____BEH____ ACT_____ CH 12 SOC____COG____
SET____BEH____ ACT_____ CH 13 SOC____COG____	SET____BEH____ ACT_____ CH 14 SOC____COG____	SET____BEH____ ACT_____ CH 15 SOC____COG____	SET____BEH____ ACT_____ CH 16 SOC____COG____
SET____BEH____ ACT_____ CH 17 SOC____COG____	SET____BEH____ ACT_____ CH 18 SOC____COG____	SET____BEH____ ACT_____ CH 19 SOC____COG____	SET____BEH____ ACT_____ CH 20 SOC____COG____

APPENDIX A

Play and Non-Play Coding Categories
(Glengarry Project Report, 1980)

Non-play Behaviours

1. Non-routine activities (combined to create one category: other):

o - no observable activity. Child is not watching, appears uninvolved and detached.

on - onlooker. Child is passive. Not involved in the activity, but focussed and watching. May be Talking to others who are doing the activity.

w - wandering. Random movement not appearing to have any particular focus, purpose or direction.

→ - transition. Purpose of behaviour is to move from one setting to another. Child is not in a play activity. Purpose is clear.

waiting - Purpose is clearly waiting to participate in an activity.

C - conversation. The only activity is conversation. No play activity is in progress or being planned.

2. Routine activities (combined to create one category: routine):

- snack/eating
- tidying
- washroom
- tie shoes
- getting materials

Social Characteristics of Activity

Indicates the degree of coordination of actions. Hierarchical. Code the highest category occurring.

Solitary - Non-coordinated (combined to create one category: solitary)

/ - solitary. Child is apart and alone.

/+ - other child or children are present but are carrying on a separate activity and child is making no reference to them.

APPENDIX A.

Parallel - Non-coordinated (combined to create two categories: Parallel with no language, parallel with language):

// - other child or children are present and doing the same or similar activity. There is no language observed.

//- - same as above, but there is language which does not relate to the activity.

//+ - language relates to the activity.

Coordinated (combined to create one category: coordinated):

C- - competitive. Activity is coordinated, but there is an attempt by one child to achieve the goal first.

C+ - cooperative. Activity is coordinated with others to achieve a desired common goal or end. No attempt to achieve the goal first by one individual.

Cognitive Characteristics of Activity

Indicates the mental processes involved in the activity. Hierarchical.

Code the highest category occurring.

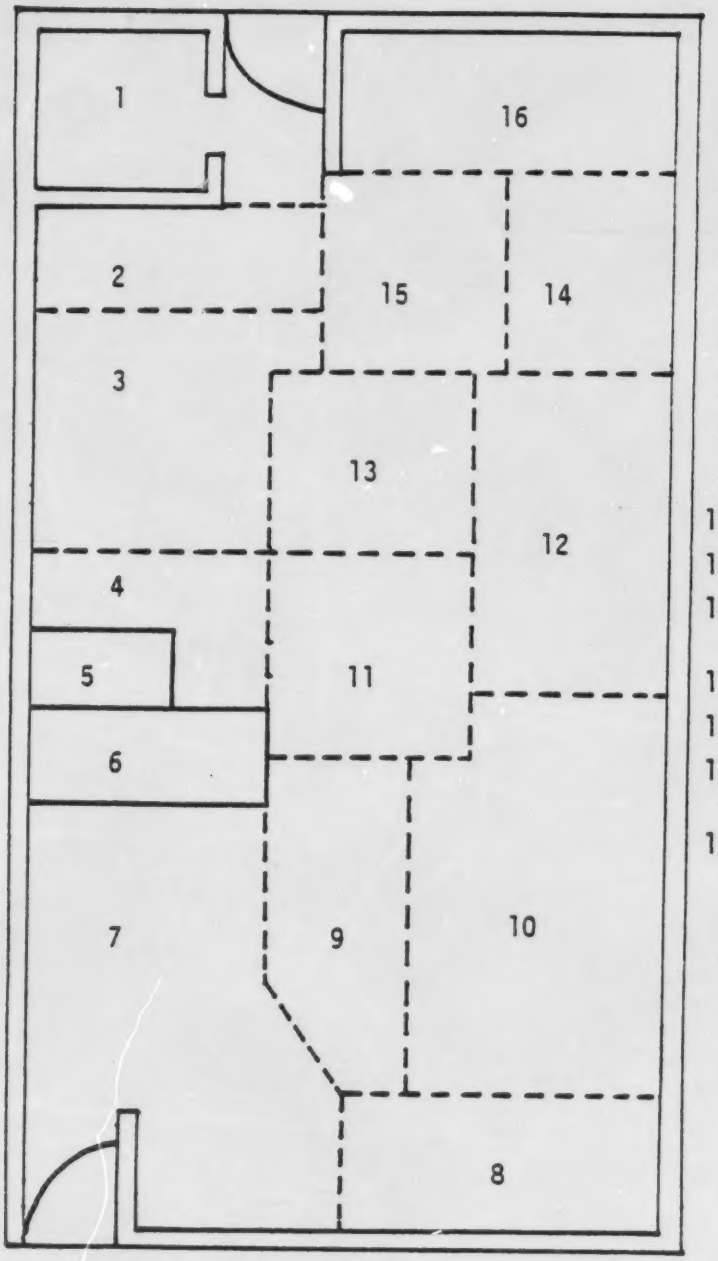
E - exploratory/functional. Simple motor activities, frequently repeated. Simple investigatory actions about abilities and qualities of self or objects.

C - constructive. Manipulation of objects or materials to create a definable product.

ID - imitative/dramatic. Child is pretending or make-believing. Takes on a role, uses objects or materials as props. Creates an imaginary situation.

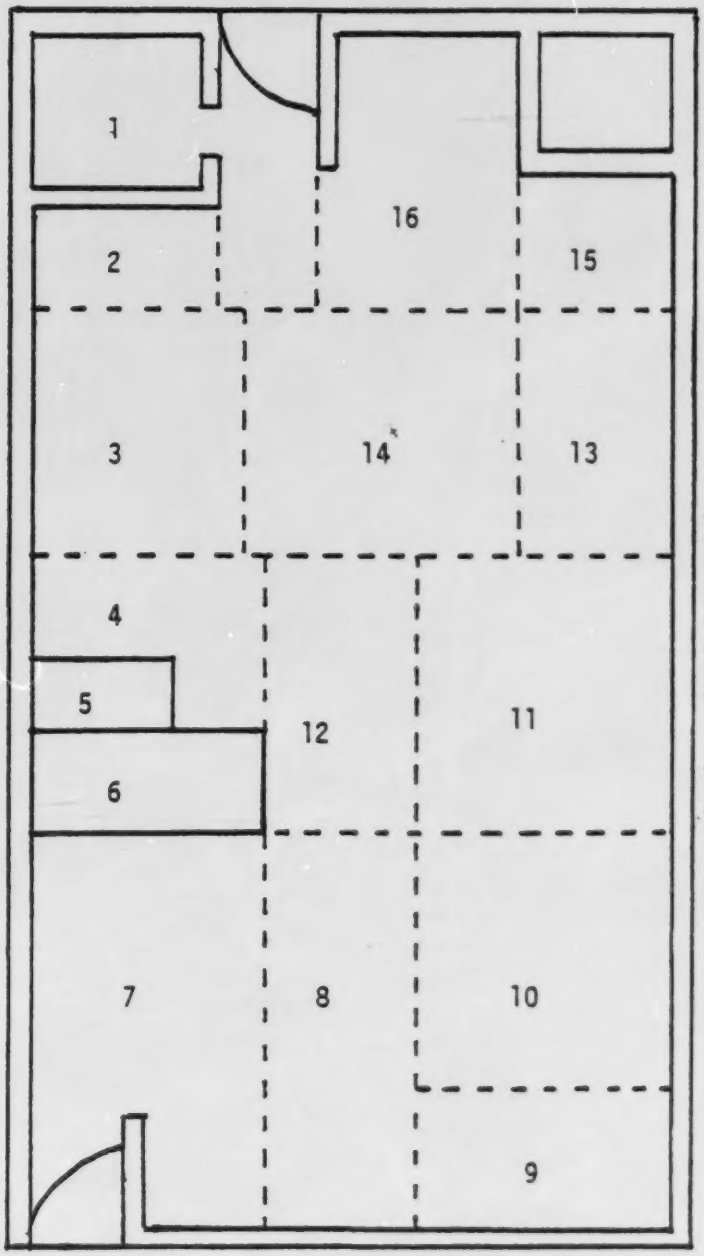
TC - testing and/or contesting. Child is making attempt to achieve a set goal, testing self and skills or objects in the process. May be competing with another or others. Accepts prearranged rules and adjusts to them. Includes games-with-rules, games of strategy, chance or physical skill or prowness.

APPENDIX B



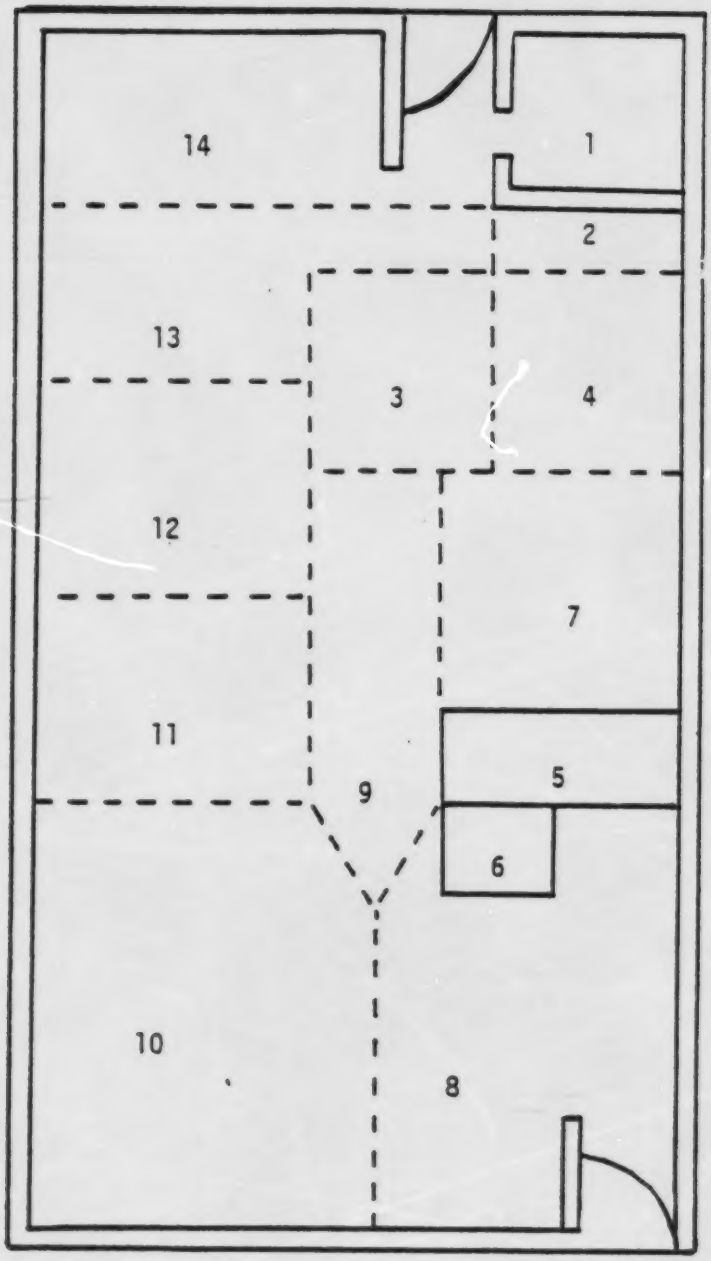
1. Bathroom/ Hall
2. Water Table
3. Craft Area 'A'
4. Under Loft
5. Little Loft
6. Big Loft
7. Blocks
8. House
9. Felt Board
10. Music/Book
11. Table Toys
12. Sand Table/ Storage
13. Paint Easel
14. Puzzle/Snack
15. Craft Area 'A'
16. Teacher Storage

Figure 1. Room A in regular condition.



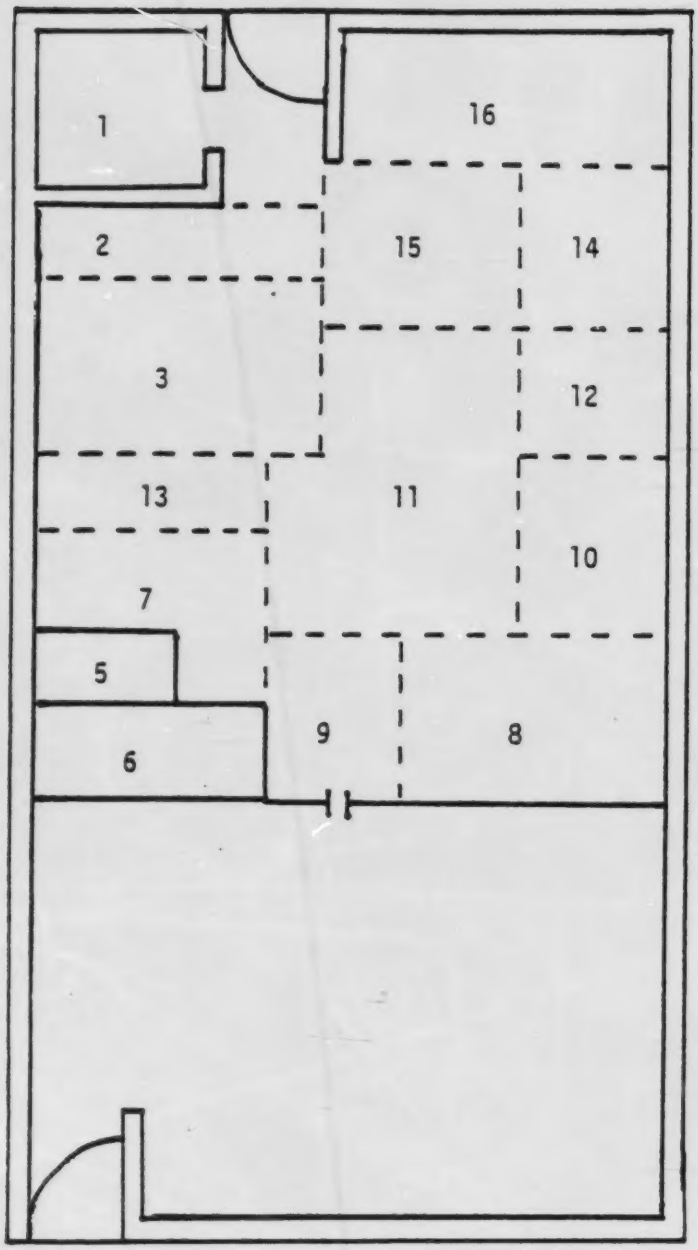
1. Bathroom/ Hall
2. Water Table
3. Craft Area 'A'/Snack
4. Fisher-Price Toys
5. Little Loft
6. Big Loft
7. Block
8. Access
9. House
10. Music/Book
11. Table Toys
12. Access/Chalk
13. Playdough
14. Craft Table 'B'
15. Sand Table
16. Teacher Storage

Figure 2. Room B in regular condition.



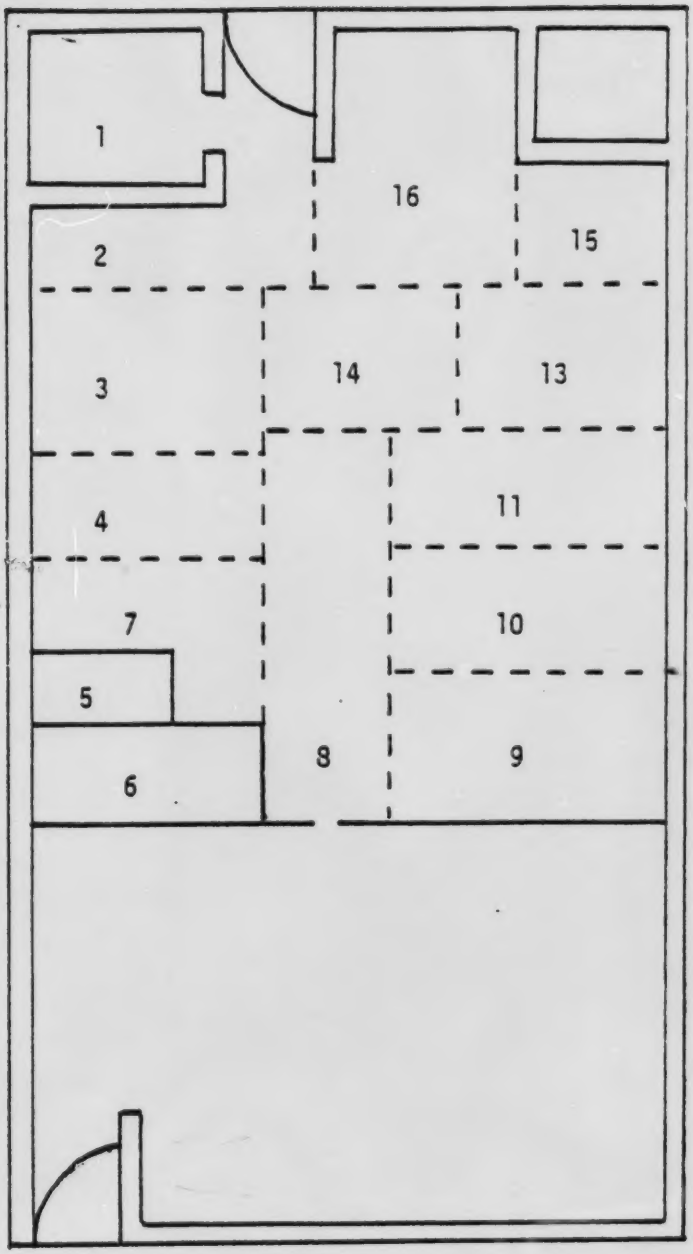
1. Bathroom/ Hall
2. Sink
3. Craft Area 'A'
4. Craft Area 'B'
5. Big Loft
6. Little Loft
7. House
8. Blocks
9. Table Toys
10. Music/Book
11. Small Blocks
12. Scrap Table
13. Natural Materials
14. Snack/Craft Area 'C'

Figure 3. Room C in regular condition.



1. Bathroom/ Hall
2. Water Table
3. Craft Area 'A'
4. (removed)
5. Little Loft
6. Big Loft
7. Blocks
8. House
9. Felt Board
10. Music/Book
11. Table Toys
12. Sand Table/ Storage
13. Paint Easel
14. Puzzle/Snack
15. Craft Area 'B'
16. Teacher Storage

Figure 4. Room A in compacted condition.



1. Bathroom/ Hall
2. Water Table
3. Craft Area 'A'/Snack
4. Fisher-Price Toys
5. Little Loft
6. Big Loft
7. Blocks
8. Access
9. House
10. Music/Book
11. Table Toys
12. (removed)
13. Playdough
14. Craft Area 'B'
15. Sand Table
16. Teacher Storage

Figure 5. Room B in compacted condition.

APPENDIX C

Child Interview Protocol

The children were taken, one at a time, to a separate room where a model of the day care room was set-up, immediately after the room space had been returned to normal size.

1. Do you know what room this is?
   (If the child does not identify the model as the day care room, he is told that it is.)
2. If we came in through the door, what is the first part of the room we would see? (Point to the setting in question. If the child does not answer correctly, give hints by pointing out furniture, and if this is not successful, identify the area for the child.)
3. Repeat for each area.
4. Give the child a small doll which is identified as the child being interviewed.
5. Put_____(child's name) in the block area? (If the child is not successful, give hints to indicate what materials would be found there. If this is not successful, indicate to the child where that area would be.)
6. Repeat for each setting, until child is 100% successful.
7. Is the room the same today as it was last week?
   (Probe to find out what changes had been made.)
8. Is the room smaller or larger today than it was last week?
   (An incorrect response eliminated the child from further questioning.)

At this point when the room was identified as being larger, the child and the interviewer rearranged the model to simulate the room with the smaller area.

9. Did you like the room better when it was smaller or when it was larger? Why? (Ask questions based on response to find out reasons for preference.)

10. Is it easier to play when the room is smaller or the room bigger? Why? (Probe to determine reasons for preferences.)

11. If you could choose, which would you prefer to have the room smaller or the room bigger? Why? (Probe to determine reasons for preference.)

12. How did you feel when the room was smaller? bigger? Why? (Probe to determine basis for feelings.)

13. Where do you like to play when the room is big? small? Why?

APPENDIX D

Staff/Adult Interview Protocol

1. Interviewer: I'm interested in getting your reactions to the change in space. We have no expectations as to the way the change may have affected different aspects of the program, the children or the staff, and we're interested in any and all of your reactions to the change. Can you describe any effects that you may have noticed during the period of time when the space was reduced with regard to

    1) where the children played
    2) social interactions of the children
    3) emotional climate
    4) staff
    5) staff-child interaction
    6) program

2. When we changed the rooms, we tried to maintain the same amount of equipment, the same program and the same organization of the room. If you had to work in a room that size all the time, would you make any changes in the way you worked?

    The interviewer requested the staff member to discuss her reactions. The interviewer only interjected to clarify a specific point or to encourage comment on an area that had been missed.

APPENDIX E

Child Interview Responses

Reasons Given to Support Preference For the Larger Area

Older Male

- I didn't like to play in the blocks (when the room was small) because we had to clean up. I don't like to clean up.
- It was more fun when it was bigger because we had a lot of fun here (in the block corner) and we didn't have nothing over us (loft). And we had those different kind of blocks.
- I would choose to have the room big because we have something here and here (indicating back of the room) and we can have the blocks there (indicating back of the room) and we can have a lot of fun with the other kind of blocks.
- I didn't like to play in the table toy corner because it wasn't very big for us to fit and there was a little table and now there is a big table.

Older Male

- I like the room better when it's bigger because I can go here (pointing to blocks) and everywhere.

Older Female

- I like (the room) better when it's bigger 'cause you have more room in the housekeeping corner and even the sand box and we don't have to get that squished in and we can use the orange table - the one with the play dough.
- It's easier to play when it's bigger 'cause the story corner isn't that small and we don't have to all gather up and bump each other.
- It's more fun to play when it's big because there's a block corner over here so that the boys won't be banging up here (under loft) when we play up here (on top of loft) and we don't have to move everything.

Older Female

- I'd choose to have the room big because you can play everywhere.

Younger Male

- I like it better when it's big because there's more room to walk and play.

Younger Male

- I don't like it squished 'cause I always fell down. I bumped the wood.

Younger Female

- I like it better when it's big because we can go in here (empty area at back of room).

Reasons Given to Support Preference For Smaller Area

Older Male

- I like it smaller because the room is all scrunched up and we can sleep by each other.

Older Female

- I liked it better when it was smaller because then we could hide in the block corner. We had little books and made a little cover and hung up a big blanket.
- I liked it when it was small 'cause then when you played in the block corner you could hide on someone if they were your friend.

Younger Female

- I liked the room better when it was smaller because I liked the room when it was squished.